

The following meeting notes are a product of the Columbia River Treaty 2014/2024 Review Process. Nothing recorded in the notes can be attributed to a single sovereign entity and are for reference purposes only. This document is pre-decisional and confidential and cannot be disclosed.

Columbia River Treaty 2014/2024 Review Water Quality Technical Team Conference Call

Friday, March 9, 2012, 1:00 pm – 2:30pm
Location: Conference Call

Technical Team Co-Chairs: Bill Abadie, U.S. Army Corps of Engineers; and Birgit Koehler, Bonneville Power Administration

Conference Call Notes by: Terry Buchholz, Integrated Water Solutions

Conference Call Attendees

Name	Organization
Water Quality Technical Team Members Present:	
Birgit Koehler	Bonneville Power Administration (BPA)
Bill Abadie	U.S. Army Corps of Engineers (USACE)
Jen Boyer	Bonneville Power Administration (BPA)
Sharon Parkinson	U.S. Bureau of Reclamation (Reclamation)
Scott English	U.S. Army Corps of Engineers (USACE)
Ben Cope	U.S. Environmental Protection Agency (EPA)
Stuart Rounds	U.S. Geological Service (USGS)
John Risley	U.S. Geological Service (USGS)
Bill Proctor	U.S. Army Corps of Engineers (USACE)
Rob Annear	Geosyntec
Beau Patterson	Douglas County Public Utility District (PUD)
Steve Juul	U.S. Army Corps of Engineers (USACE)

Meeting Notes

1. Introductions, Background and Meeting Objectives

Attendees on the conference call identified themselves (see above). The meeting objectives were the following:

- Discuss the status and progress concerning the Treaty Review water quality modeling approach;
- Identify the path forward concerning approach for the Water Quality temperature modeling; and
- Understand the limitations and features of the RBM-10 water quality model.

The following meeting notes are a product of the Columbia River Treaty 2014/2024 Review Process. Nothing recorded in the notes can be attributed to a single sovereign entity and are for reference purposes only. This document is pre-decisional and confidential and cannot be disclosed.

Status: The Corps has hoped to develop CE-QUAL-W2 (W2) System model for the mainstem Columbia River and combine it with the existing lower Snake River System W2 model, but funding was not available this fiscal year to take this approach. There are limitations with the RBM-10 model approach. It is important that we all document what RBM-10 will be able to answer - and what it won't be able to answer and provide these details in the water quality work plan.

2. Modeling Methodology: RBM-10

There was a disconnect between the written proposal for the RBM-10 approach and what was discussed in the last STT Water Quality Work Group meeting in February regarding its use as a screening tool vs. an assessment tool for the CRT Iterations. We need to define the water temperature assessment as we know it now, and provide a technical scope of work, schedule, and budget to produce it. It will be important to define how the RBM-10 model will interface with the CE-QUAL-W2 model outputs from Lake Roosevelt and Dworshak Reservoir. We also need to clearly articulate the limitations and constraints with this approach.

The next step will be to migrate the 1-page RBM-10 proposal into a detailed work plan. The agenda today will help us work toward developing that detailed work plan for the water temperature assessment.

The current proposal as we understand it recommends just using RBM-10 as a screening tool for Iterations #1, #2 and #3 using the CE-QUAL-W2 models for Lake Roosevelt and Dworshak CE-QUAL-W2 feeding the RBM-10 model. USGS is best positioned to draft this new work plan.

It was suggested that a good prediction of error of a temperature model is between 0.5 and 1.0 degree Celsius mean absolute error. The RBM-10 model for the Klamath basin was at the high end of that range of error.

When modeling run-of-river projects and vertical stratification is not considered a primary issue, then RBM-10 may be an appropriate tool. RBM-10 should be an adequate for impact analysis through comparing model runs for informing the Treaty Review recommendation. Those more detailed questions previously described as near-term and long-term objectives will not be satisfied with this simplified approach. Many of the WQ technical team members have already expressed reservation in the use of the RBM-10 model for water temperature assessment and the application of a one dimensional model for the Treaty Review.

There are many questions concerning the RBM-10 model (*Answers were inserted after the questions*):

- What tributaries are being modeled? *Includes all the major tributaries*
- What bathymetry is being used? *Pre-2000 bathymetry was used*
- *What data and metrics can we get out of RBM-10?*

Commented [SEE1]: Stewart, this is too vague to be of any value. Agree?

Commented [SEE2]: Stewart or Ben did you have a response?

The following meeting notes are a product of the Columbia River Treaty 2014/2024 Review Process. Nothing recorded in the notes can be attributed to a single sovereign entity and are for reference purposes only. This document is pre-decisional and confidential and cannot be disclosed.

- What is technically in the model?

Commented [SEE3]: Stewart or Ben is this a useful question & if so, could you provide a response?

Action Items: Ben Cope will send out the RBM-10 Report that describes these attributes. *Ben Cope has provided the documentation to Scott English Friday afternoon and it has been posed to the WQ SharePoint.* Also, reference the white paper that Stuart Rounds authored concerning the characteristics of RBM-10.

Based on a previous discussion with ODEQ, they questioned whether the Hells Canyon Complex should be included in the temperature modeling. BPA explained that the CRT alternatives are not proposing operational changes that would warrant extending the geographic domain beyond the Anatone gauge. However there may be one or two exceptions in Iteration #2 that will look at expanding the definition of Effective Use and may need to investigate it a little further. There was general agreement that if there are no significant management changes that will be made by CRT alternatives in Hells Canyon, then there is no justification to extend the upper boundary for the Snake River temperature modeling. This was the same methodology applied to the Kootenai and Pend Oreille tributaries. Ben said the RBM-10 model currently extends to Brownlee Dam. Also, Idaho Power has a CE-QUAL-W2 model of Brownlee reservoir. The lower boundary for the water temperature model is proposed below Bonneville Dam, at either Warrendale or Camas-Washougal.

RBM-10 uses volume-depth relationships for the reservoirs. For the free flowing river, RBM-10 uses cross sections at key locations.

The Lake Roosevelt CE-QUAL-W2 model is using the most recent bathymetry collected by the USBR in 2010-2011.

The RBM-10 model time-step is daily, but it can use an hourly methodology and inputs with additional programming. The programmed water temperatures are the release temperatures through the turbine scroll-case. This approach ignores surface warming that can be present in other outlet releases, and at times this can be a significant over simplification. It was affirmed that one cannot get daily max temperatures from RBM-10 as it is currently configured. It was discussed that the model could be reprogrammed, or some form of post-processing algorithm applied. RBM-10 uses only 5 meteorological stations for the Columbia Basin and this number could be increased if you want to develop RBM-10 further - this would be a lot of work. There was general agreement that these potential reprogramming updates of RBM-10 were not warranted with limited funding and time. Again, there was general agreement on the understanding of the limitations and uncertainties introduced as a result.

3. Implementation of Modeling Methodology

Need to document these discussions in a more detailed technical work plan for temperature modeling. The narrative will need to layout the assumptions, limitations and reference the RBM-10 reports that have already been developed.

Action Item: USGS will develop a detailed technical work plan for the development of the temperature models. This will include the detailed description of work, schedule

The following meeting notes are a product of the Columbia River Treaty 2014/2024 Review Process. Nothing recorded in the notes can be attributed to a single sovereign entity and are for reference purposes only. This document is pre-decisional and confidential and cannot be disclosed.

and budget. It should also define the interface of CE-QUAL-W2 and RBM-10 at the storage reservoirs (Lake Roosevelt & Dworshak). The work plan should also explain anticipated needs of other technical team members to support development and review.

Action Item: Bill Abadie and Birgit to present the water quality temperature modeling approach to the STT. This will include the work plan and the strengths and limitations paper that Stuart Rounds prepared for the February 15, 2012, STT Water Quality Work Group meeting. The STT will review and provide any additional direction and questions, prior to the work proceeding.

Model Application - Questions that will need to be answered before the temperature modeling moves forward:

- **Data:** What years of data will be included in the temperature models? RBM-10 currently includes the years 1975-2000. Will this data set be updated 2011? Or will the model just focus on certain extreme and median years in the 70-year period of record (1920-1999) used by the Hydsim or ResSim models? The constraint will be tied to the upstream CE-QUAL-W2 model. Lake Roosevelt model is using the last 10 water years (2000 – 2010) and selecting low, average and high years. Will this be an issue? Taking the 14-period outputs from Hydsim and shaping these into daily data. Need to bracket what you are trying to look at and then document which years you will be running. Don't become water year specific based on the assigned assumptions. Hydsim is water year specific. Rank the water years and associate water quality assumptions to these predictions. Need to marry CE-QUAL-W2 and RBM-10. Temperature data has expanded – use the better data.
- **Stratification:** How much does the cross-section stratification translate through the structures (dams)? There is more stratification at Grand Coulee. RBM-10 looked at this in December 2003 when EPA was developing a TMDL for the Columbia River. They had the same dilemma back in the early 2000's. Would both models need to be calibrated for the same period? You would calibrate the models to a range of years and you could also run a sample of years. Advantage of RBM-10 is that you can run a longer period of record, more quickly, but that does not necessarily tie into the CE-QUAL-W2 models.
- **Alternatives:** RBM-10 may not be capable of simulating the range that we plan on simulating for alternatives. Need to understand the limitations and caveats. RBM-10 accounts for both surface area and volume curves.

Information Exchange: Scott English is establishing a WQ SharePoint site for the Water Quality Technical Team. This will be used to exchange data, models and reports. The SharePoint site will be the primary conduit for sharing items back and forth.

Action Item: Scott English will get SharePoint invitations sent out to the Water Quality Technical Team outside of the Corps. Also the Corps had considered using DrChecks for

Commented [RA4]: Agreed.

Commented [SEE5]: I have concerns about the way this section is written, but do not have time to fix it before sending it out. There seems to be confusion about using certain years to calibrate and validate a model vs. the simulation years. Sharron made a good point that the W2 model should be calibrated to a range of years in regards to meteorology and hydrology. Scott mentioned that the period 1995- 2005 might capture adequate extreme conditions for the CRT review purposes.

A question for the team is do the two models need to be calibrated to the same years? And does this have to be the same years that the hydrology models were calibrated to? I suspect not, but if so then document this to alert the reader.

Commented [RA6]: If the lake roosevelt model is calibrated to a robust number of years (low, med, high) and RBM -10 is as well then you are fine. Ideally its best if it's the same years but it does not have to be. Having said that you may still need to run Lake Roosevelt for different years in order to provide boundary condition flows to the RBM-10 model. The difference in the much longer record for RBM-10 means this model will have been developed and calibrated for higher and lower flows than LR for 10 years. This is an issue. It was 10 years for each but with little overlap then the implication would be different.

One the advantages noted by others of using RBM-10 was the need to not pick individual years but run the whole record.

If the hydrology used in the flood studies is base don a X year record then this work should be a subset of this or the full record to be consistent. If flows from Hydsim are to be used and processed to daily flows then the methodology should be documented. There should be a clear path with scientific defense on how the piece come together.

If water year specific flows are used then this approach should be justified. It would certainly make the modeling go faster.

Commented [RA7]: There are two issues here. 1) if the flow range in CRT is outside the range of RBM-10 calibration then uncertainty rises but this would be the case with any model. 2) If we are trying to understand the impact of different operations (spill vs. gaes etc.) for the same hydrology then RBM-10 may have issues

The following meeting notes are a product of the Columbia River Treaty 2014/2024 Review Process. Nothing recorded in the notes can be attributed to a single sovereign entity and are for reference purposes only. This document is pre-decisional and confidential and cannot be disclosed.

technical review of documents, but it was thought that outside users may find DrChecks challenging at first. The strength of this approach is that it catalogs a permanent record of review comments, how they were responded to, and the back check by the reviewer. This is not easily replicated by track changes feature of Word, or an equivalent process using a spreadsheet. More discussion to come on this point, and Terry will look into how other teams intend to proceed.

Commented [RA8]: This is a very good idea.

Vertical Datum: Scott explained that it will be very important to document vertical datum – both NAVD88 and NGVD29 are being used in the databases, hydrosurvey and models. It will be very important to document and understand implications of which vertical datum is being used by each model and if translators between the 2 different datum are being used with model pre-processors.

- NAVD88 – ResSim and Lake Roosevelt CE_QUAL-W2
- NGVD29 – Water control plans and Hydsim

4. Next Steps:

Need to prepare the master water quality work plan for the TDG and water temperature. The following are major sections of the work plan to be included.

Preliminary Assessments: Focus is to investigate and be able to assign accurate TDG and water temperature values at the upstream boundaries for the different Treaty Review alternatives. This is particularly important for the US-Canadian border to start both models. In previous meetings we agreed that we would not be modeling in Canada, nor would we be modeling up the Kootenai or Pend Oreille tributaries. Thus the primary focus for the technical team will be to provide mass balance to output from the Arrow, Brilliant, and Waneta projects for assigning TDG & water temperature values. This might be done with a pre-processor using the ResSim and/or Hydsim hydro model outputs. The Corps has drafted some of these details and will provide them for the technical team for review and comments.

Additionally, there is not a comprehensive set of data for all the dams in the Columbia Basin, including ownership, authorized purposes, range of operation, number of turbines, number of spill bays, other outlets, etc. Jack Camp (Corps) has started a spreadsheet to catalog this information for all of the projects. The technical team should divvy up the dams by ownership and update this spreadsheet. Important reminder is that the model baseline is 2024, thus the current configuration AND the proposed 2024 configuration both should be documented for each project in this spreadsheet update. Water control manuals are one source of information, but these are often not up to date, and future improvements due to be complete by 2024 are not included.

SYSTDG Model Update: The TDG model (SYSTDG) has been developed and calibrated for the with fish passage projects of the lower Columbia and lower Snake but needs to be updated with input for the Mid-C projects and Grand Coulee. Grant, Chelan and Douglas PUDs – What are the latest structural and operational changes? What other

The following meeting notes are a product of the Columbia River Treaty 2014/2024 Review Process. Nothing recorded in the notes can be attributed to a single sovereign entity and are for reference purposes only. This document is pre-decisional and confidential and cannot be disclosed.

data would be helpful in characterizing the TDG exchange relationships? Also need this information for Grand Coulee. Mike Schneider is working with PUD & Reclamation team members to gather these critical details.

How about the Spokane River? TMDL for the Spokane River focused on phosphorous loading and dissolved oxygen depletion in Long Lake. Could use this as a surrogate for TDG? Probably not. TDG is a concern on the Spokane River. TMDL is only extended to Long Lake Dam. This is used as the boundary condition for the Grand Coulee TDG model. During the development of the CE-QUAL-W2 model for Lake Roosevelt, TDG could be incorporated if that approach were useful. It was recommended to gather TDG information and data to establish these boundary conditions. Good documentation is essential here and should include all assumptions, constraints, etc.

Commented [SEE9]: Is this really even relevant at this point??

Retrofits have occurred on many of the Canadian projects (i.e. Arrow, Brilliant). Retrofits are also planned for several Canadian projects prior to 2024 (i.e. Mica, Revelstoke). As discussed, these details should be carefully documented as current configuration and future configuration so there is no confusion later on.

BPA has recently completed the Treaty terminates white paper and associated spreadsheet with three most likely Canadian scenarios. The primary take away was that for treaty Terminates, Canada would not draft Arrow as much as they would under a Treaty Continues scenario, and there would be a steadier year around release from the project. This paper has been finalized and is already posted on the WQ SharePoint.

Time/Cost: Need to develop a detailed budget and schedule for the TDG and water temperature modeling based on the detailed work plans. Terry suggested it would be helpful to develop the schedule as a gantt chart in MS Project and indicate resource needs, predecessors, etc. so this can be rolled up into the Treaty Review master schedule.

Need to define key milestones for interaction with the STT Water Quality Work Group, and STT. Additionally a general timeline will be developed to indicate how the Water Quality deliverables will interface with general Treaty products.

Need to define the roles and responsibilities for the water quality technical team. Participation of team members is not being supported by the Treaty Review (i.e. Entity). Need to establish a smaller water quality technical team that will work together to get the preliminary assessment completed and the models set up. Checkpoints for peer review at specified milestones need to be identified and included in the timeline and schedule.

Action Item: Bill and Birgit will develop a short, 2-page master water quality work plan that will be used reviewed by the STT at their meetings on March 15 – 16, 2012.

Action Item: Reconvene the Water Quality Technical Team in a couple weeks.

5. Action Item Summary:

The following meeting notes are a product of the Columbia River Treaty 2014/2024 Review Process. Nothing recorded in the notes can be attributed to a single sovereign entity and are for reference purposes only. This document is pre-decisional and confidential and cannot be disclosed.

- Ben Cope will send out the RBM-10 Report that describes these attributes. *Ben has already provided these to Scott and they are posted to the WQ SharePoint.*
- USGS will develop a detailed technical work plan for the development of the temperature models. This will include the detailed description of work, schedule and budget.
- Scott English will get SharePoint invitations sent out to the Water Quality Technical Team. *Scott has been working with the Corps IT contractor (ACE-IT) regarding the problems providing user access and found the problems were much more widespread than realized. More to come and Scott will keep the WQ technical team apprised of developments.*
- Bill and Birgit will develop a short, 2-page master water quality work plan that will be used reviewed by the STT at their meetings on March 15 – 16, 2012. Bill Abadie and Birgit to present the water quality temperature modeling approach to the STT. *This was prepared and submitted to STT.*
- Reconvene the Water Quality Technical Team in a couple weeks.